

Claims

[1] A driving apparatus for a washing machine comprising:
a tub which contains washing water, and receives a drum such that the drum is rotatable;
a dual rotor which includes an outer rotor including magnets supported by an inner peripheral surface of the outer rotor, and an inner rotor arranged inside the outer rotor, the inner rotor including magnets supported by an outer peripheral surface of the inner rotor;
a bearing housing which is formed at a rear wall of the tub in accordance with an insert molding method such that the bearing housing is integral with the tub, the bearing housing rotatably supporting a drum shaft connecting the drum and the dual rotor;
a motor mounting bracket which is mounted to the rear wall of the tub; and
a stator which is mounted to the rear wall of the tub via the motor mounting bracket such that the stator is arranged between the outer rotor and the inner rotor, the stator generating magnetic energy using electrical energy supplied from an external of the stator, to rotate the dual rotor.

[2] The driving apparatus according to claim 1, wherein the stator includes:
a core arranged such that opposite surfaces of the core face the magnets of the outer rotor and the magnets of the inner rotor, respectively;
an insulator made of an insulating material, the insulator enclosing the core;
coils wound around the insulator;
a molded member formed in accordance with an insert molding method to enclose the insulator and the coils such that the molded member is integral with the insulator and the coils while allowing the opposite surfaces of the core to be exposed; and
a coupling member extending from the molded member, the coupling portion being mounted to the rear wall of the tub via the motor mounting bracket.

[3] The driving apparatus according to claim 1, wherein the stator includes:
a core arranged such that opposite surfaces of the core face the magnets of the outer rotor and the magnets of the inner rotor, respectively;
an insulator enclosing the core;
coils wound around the insulator; and
a coupling member extending from the molded member, the coupling member

being mounted to the rear wall of the tub via the motor mounting bracket.

[4] The driving apparatus according to claim 1, further comprising:
a plurality of bracket mounting bosses formed at the rear wall of the tub; and
a plurality of outer coupling holes formed through the motor mounting bracket
such that the outer coupling holes correspond to the bracket mounting bosses, re-
spectively,
whereby the motor mounting bracket is mounted to the tub when bolts are
fastened through the bracket mounting bosses of the tub and the outer coupling
holes of the motor mounting bracket.

[5] The driving apparatus according to claim 4, further comprising:
a plurality of stator mounting bosses formed at the rear wall of the tub;
a plurality of inner coupling holes formed through the motor mounting bracket
such that the inner coupling holes correspond to the stator mounting bosses, re-
spectively; and
a plurality of coupling holes formed at the stator such that the coupling holes
correspond to the stator mounting bosses, respectively, and correspond to the
inner coupling holes, respectively,
whereby the stator is mounted to the tub when bolts are fastened through the
stator mounting bosses, the inner coupling holes, and the coupling holes, in this
order.

[6] The driving apparatus according to claim 1, further comprising:
a positioning unit which determines positions of the motor mounting bracket and
the stator to be fixed with respect to the tub such that the stator is concentrically
coupled to the drum shaft.

[7] The motor according to claim 6, wherein the positioning unit includes:
at least one positioning protrusion protruded from the tub;
a first positioning hole formed through the motor mounting bracket such that the
first positioning hole receives the positioning protrusion; and
a second positioning hole formed through the stator such that the second po-
sitioning hole receives the positioning protrusion.

[8] The driving apparatus according to claim 6, wherein the positioning unit includes:
at least one first positioning hole formed at the tub;
a second positioning hole formed through the motor mounting bracket such that
the second positioning hole corresponds to the first positioning hole; and
a positioning protrusion protruded from the stator such that the positioning

protrusion extends through the first and second positioning holes.

[9] The driving apparatus according to claim 5, further comprising:
an auxiliary bracket which is interposed between the stator and the motor mounting bracket, and is formed with a plurality of bolt coupling bosses respectively corresponding to the stator mounting bosses, the inner coupling holes, and the coupling holes.

[10] The driving apparatus according to claim 9, wherein the auxiliary bracket has an annular shape.

[11] The driving apparatus according to claim 9, wherein the auxiliary bracket is made of an aluminum material.

[12] The driving apparatus according to claim 9, further comprising:
a positioning unit which determines positions of the auxiliary bracket and the stator to be fixed with respect to the tub such that the stator is concentrically coupled to the drum shaft.

[13] The driving apparatus according to claim 12, wherein the positioning unit includes
at least one first positioning hole formed at the tub;
a first positioning pin protruded from the auxiliary bracket toward the tub such that the first positioning pin is inserted into the first positioning hole;
a second positioning hole formed through the auxiliary bracket; and
a second positioning pin protruded from the stator toward the auxiliary bracket such that the second positioning pin is inserted into the second positioning hole.

[14] The driving apparatus according to claim 2, wherein the molded member of the stator is provided with a reinforcing member for increasing a strength of the molded member.

[15] The driving apparatus according to claim 14, wherein the reinforcing member comprises a plurality of reinforcing ribs formed at an outer surface of the molded member such that the reinforcing ribs are integral with the molded member.

[16] A driving apparatus for a washing machine comprising:
a tub which contains washing water, and receives a drum such that the drum is rotatable;
a dual rotor which includes an outer rotor including magnets supported by an inner peripheral surface of the outer rotor, and an inner rotor arranged inside the outer rotor, the inner rotor including magnets supported by an outer peripheral surface of the inner rotor;

a bearing housing which is formed at a rear wall of the tub in accordance with an insert molding method such that the bearing housing is integral with the tub, the bearing housing rotatably supporting a drum shaft connecting the drum and the dual rotor;

a motor mounting bracket which is mounted to the rear wall of the tub; and a stator which is mounted to the motor mounting bracket such that the stator is arranged between the outer rotor and the inner rotor, the stator generating magnetic energy using electrical energy supplied from an external of the stator, to rotate the dual rotor.

[17] The driving apparatus according to claim 16, wherein the stator includes:
a core arranged such that opposite surfaces of the core face the magnets of the outer rotor and the magnets of the inner rotor, respectively;
an insulator made of an insulating material, the insulator enclosing the core;
coils wound around the insulator;
a molded member formed in accordance with an insert molding method to enclose the insulator and the coils such that the molded member is integral with the insulator and the coils while allowing the opposite surfaces of the core to be exposed; and
a coupling member extending from the molded member, the coupling portion being mounted to the rear wall of the tub via the motor mounting bracket.

[18] The driving apparatus according to claim 16, wherein the stator includes:
a core arranged such that opposite surfaces of the core face the magnets of the outer rotor and the magnets of the inner rotor, respectively;
an insulator enclosing the core;
coils wound around the insulator; and
a coupling member extending from the molded member, the coupling member being mounted to the rear wall of the tub via the motor mounting bracket.

[19] The driving apparatus according to claim 16, further comprising:
a plurality of bracket mounting bosses formed at the rear wall of the tub; and
a plurality of outer coupling holes formed through the motor mounting bracket such that the outer coupling holes correspond to the bracket mounting bosses, respectively,
whereby the motor mounting bracket is mounted to the tub when bolts are fastened through the bracket mounting bosses of the tub and the outer coupling holes of the motor mounting bracket.

[20] The driving apparatus according to claim 19, further comprising:
a plurality of inner coupling holes formed through the motor mounting bracket;
and
a plurality of coupling holes formed at the coupling member of the stator such
that the coupling holes correspond to the inner coupling holes, respectively,
whereby the stator is mounted to the motor mounting bracket when bolts are
fastened through the inner coupling holes and the coupling holes, in this order.

[21] The driving apparatus according to claim 20, further comprising:
an auxiliary bracket which is interposed between the coupling member of the
stator and the motor mounting bracket, and is formed with a plurality of bolt
coupling bosses respectively corresponding to the inner coupling holes of the
motor mounting bracket and the coupling holes of the stator.

[22] The driving apparatus according to claim 17, wherein the molded member of the
stator is provided with a reinforcing member for increasing a strength of the
molded member.

[23] The driving apparatus according to claim 22, wherein the reinforcing member
comprises a plurality of reinforcing ribs formed at an outer surface of the molded
member such that the reinforcing ribs are integral with the molded member.

[24] A driving apparatus for a washing machine comprising:
a tub which contains washing water, and receives a drum such that the drum is
rotatable, the tub including a plurality of bracket mounting bosses formed at a
rear wall of the tub, and a plurality of stator mounting bosses formed at the rear
wall of the tub;
a dual rotor which includes an outer rotor including magnets supported by an
inner peripheral surface of the outer rotor, and an inner rotor arranged inside the
outer rotor, the inner rotor including magnets supported by an outer peripheral
surface of the inner rotor;
a bearing housing which is formed at a rear wall of the tub in accordance with an
insert molding method such that the bearing housing is integral with the tub, the
bearing housing rotatably supporting a drum shaft connecting the drum and the
dual rotor;
a motor mounting bracket which is mounted to the rear wall of the tub, and is
formed with a plurality of outer coupling holes respectively corresponding to the
bracket mounting bosses such that bolts are fastened through the outer coupling
holes and the corresponding bracket mounting bosses, and a plurality of inner

coupling holes respectively corresponding to the stator mounting bosses such that bolts are fastened through the inner coupling holes and the stator mounting bosses; and

a stator which includes a core arranged such that opposite surfaces of the core face the magnets of the outer rotor and the magnets of the inner rotor, respectively, an insulator made of an insulating material, the insulator enclosing the core, coils wound around the insulator, a molded member formed in accordance with an insert molding method to enclose the insulator and the coils such that the molded member is integral with the insulator and the coils while allowing the opposite surfaces of the core to be exposed, and a coupling member extending from the molded member, the coupling portion being mounted to the rear wall of the tub via the motor mounting bracket.

[25] The driving apparatus according to claim 24, further comprising:
an auxiliary bracket which is interposed between the coupling member of the stator and the motor mounting bracket, and is formed with a plurality of bolt coupling bosses respectively corresponding to the inner coupling holes of the motor mounting bracket and the coupling holes of the stator.

[26] A driving apparatus for a washing machine comprising:
a tub which contains washing water, and receives a drum such that the drum is rotatable, the tub including a plurality of bracket mounting bosses formed at a rear wall of the tub;
a dual rotor which includes an outer rotor including magnets supported by an inner peripheral surface of the outer rotor, and an inner rotor arranged inside the outer rotor, the inner rotor including magnets supported by an outer peripheral surface of the inner rotor;
a bearing housing which is formed at a rear wall of the tub in accordance with an insert molding method such that the bearing housing is integral with the tub, the bearing housing rotatably supporting a drum shaft connecting the drum and the dual rotor;
a motor mounting bracket which is mounted to the rear wall of the tub, and is formed with a plurality of outer coupling holes respectively corresponding to the bracket mounting bosses such that bolts are fastened through the outer coupling holes and the corresponding bracket mounting bosses, and a plurality of inner coupling holes arranged inside the outer coupling holes; and
a stator which includes a core arranged such that opposite surfaces of the core

face the magnets of the outer rotor and the magnets of the inner rotor, respectively, an insulator made of an insulating material, the insulator enclosing the core, coils wound around the insulator, a molded member formed in accordance with an insert molding method to enclose the insulator and the coils such that the molded member is integral with the insulator and the coils while allowing the opposite surfaces of the core to be exposed, and a coupling member extending from the molded member, the coupling portion being mounted to the motor mounting bracket.

[27] The driving apparatus according to claim 26, further comprising:
an auxiliary bracket which is interposed between the coupling member of the stator and the motor mounting bracket, and is formed with a plurality of bolt coupling bosses respectively corresponding to the inner coupling holes of the motor mounting bracket and the coupling holes of the stator.

[28] A driving apparatus for a washing machine comprising:
a tub which contains washing water, and receives a drum such that the drum is rotatable, the tub including a plurality of bracket mounting bosses formed at a rear wall of the tub;
a dual rotor which includes an outer rotor including magnets supported by an inner peripheral surface of the outer rotor, and an inner rotor arranged inside the outer rotor, the inner rotor including magnets supported by an outer peripheral surface of the inner rotor;
a bearing housing which is formed at a rear wall of the tub in accordance with an insert molding method such that the bearing housing is integral with the tub, the bearing housing rotatably supporting a drum shaft connecting the drum and the dual rotor;
a motor mounting bracket which is mounted to the rear wall of the tub, and is formed with a plurality of outer coupling holes respectively corresponding to the bracket mounting bosses such that bolts are fastened through the outer coupling holes and the corresponding bracket mounting bosses, and a plurality of inner coupling holes arranged inside the outer coupling holes; and
a stator which includes a core arranged such that opposite surfaces of the core face the magnets of the outer rotor and the magnets of the inner rotor, respectively, an insulator enclosing the core, coils wound around the insulator, and a coupling member extending from the insulator, the coupling portion being mounted to the rear wall of the tub via the motor mounting bracket.

[29] The driving apparatus according to claim 28, further comprising:
an auxiliary bracket which is interposed between the coupling member of the stator and the motor mounting bracket, and is formed with a plurality of bolt coupling bosses respectively corresponding to the inner coupling holes of the motor mounting bracket and the coupling holes of the stator.

[30] A driving apparatus for a washing machine comprising:
a tub which contains washing water, and receives a drum such that the drum is rotatable, the tub including a plurality of bracket mounting bosses formed at a rear wall of the tub;
a dual rotor which includes an outer rotor including magnets supported by an inner peripheral surface of the outer rotor, and an inner rotor arranged inside the outer rotor, the inner rotor including magnets supported by an outer peripheral surface of the inner rotor;
a bearing housing which is formed at a rear wall of the tub in accordance with an insert molding method such that the bearing housing is integral with the tub, the bearing housing rotatably supporting a drum shaft connecting the drum and the dual rotor;
a motor mounting bracket which is mounted to the rear wall of the tub, and is formed with a plurality of outer coupling holes respectively corresponding to the bracket mounting bosses such that bolts are fastened through the outer coupling holes and the corresponding bracket mounting bosses, and a plurality of inner coupling holes arranged inside the outer coupling holes; and
a stator which includes a core arranged such that opposite surfaces of the core face the magnets of the outer rotor and the magnets of the inner rotor, respectively, an insulator enclosing the core, coils wound around the insulator, and a coupling member extending from the insulator, the coupling portion being mounted to the motor mounting bracket.

[31] The driving apparatus according to claim 30, further comprising:
an auxiliary bracket which is interposed between the coupling member of the stator and the motor mounting bracket, and is formed with a plurality of bolt coupling bosses respectively corresponding to the inner coupling holes of the motor mounting bracket and the coupling holes of the stator.